Validity and Reliability of a Dietary Index for a Child's Eating (DICE) to Assess Diet Quality of Children Living in New Zealand

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Maryam Delshad Siyahkaly

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Abstract

Background: At present, in New Zealand, there is no valid and reliable dietary index, which can assess the adherence of children to the 'New Zealand Food and Nutrition Guidelines for Healthy Children and Young People (Aged 2 -18 years)'.

Aim: To examine the validity and reliability of the Dietary Index for a Child's Eating (DICE) in children aged 2 to 8 years living in Auckland, New Zealand.

Methods: Caregivers of healthy children (2-8 years) living in NZ were recruited by email and print advertising. Caregivers completed a four day estimated food record (4DFR) for their child, and completed the DICE online on 2 separate occasions, eight weeks apart. The DICE consists of 17 questions that refer to current statements in the 'New Zealand Food and Nutrition Guidelines for Healthy Children and Young People (Aged 2-18 years)', with greater adherence to guidelines indicated by a higher score (maximum 100). The 4DFR was the reference method for assessing validity of the DICE, and the repeated completion of the DICE questionnaire for assessing its reliability. Relative validity was assessed by comparing the DICE total score and component sub-scores with 4DFR total score and the same 4DFR component sub-scores from the questionnaire using Wilcoxon signed rank test, Spearman correlation coefficients, cross-classification, and weighted kappa (κ) statistic. For evaluating construct validity, the DICE (total score and individual components) were compared with energy and nutrient intake extracted from the 4DFR using Pearson's rank correlation coefficient and linear contrast analysis. Intra-class correlation coefficients (Cronbach's α) were used to assess the reliability of DICE.

Results: From a possible score of 100, the mean ± SD of DICE was 78.2 ± 11.5 (range from 47 to 100) and the 4DFR was 73.8 ± 10.8. Pearson's correlation coefficient showed a significant, high correlation between the total scores for DICE and 4DFR ($r = 0.72$; $P < 0.001$). Results from the weighted κ-statistic also showed that the DICE total score and 4DFR total score had very good agreement ($\kappa = 0.94$). There was a significant positive relationship between the DICE total score and vitamin C ($r = 0.53$), folate ($r = 0.45$), and calcium ($r = 0.44$) ($P < 0.001$). Results from linear contrast analysis showed that higher intake of fibre, vitamin C, vitamin A, vitamin D, folate ($P < 0.05$), and calcium ($P < 0.001$) were associated with increasing tertile of the DICE total score. Almost perfect agreement (0.87) was found through the Intra-class correlation coefficient for reliability test ($P < 0.001$).

Discussion and Conclusion: Results from this study demonstrated that DICE is a valid and reliable tool for the assessment of children's adherences to a health-promoting diet, as suggested in the 'New Zealand Food and Nutrition Guidelines for Healthy Children and Young People (Aged 2 -18 years)'.

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Adequate Intake	AI
Australian Child and Adolescent Recommended Foods Score	ACARFS
Australian Recommended Food Scores for Preschoolers	ARFS-P
Brazilian Healthy Eating Index Revised	BHEI-R
Coronary Heart Disease	CHD
Diet Quality Index	DQI
Diet Quality Index for Adolescents	DQI-A
Diet Quality Index for NZ Adolescents	NZDQI-A
Diet Quality Index for Preschool Children	DQI-CH
Diet Quality Index-International	DQI-I
Dietary Guideline Index for Children and Adolescents	DGI-CA
Dietary Index for a Child's Eating	DICE
Estimated Average Requirement	EAR
Eating Choices Index	ECI
Finnish Children Healthy Eating Index	FCHEI
Food Frequency Questionnaire	FFQ
Food-Based Dietary Guidelines	FBDG
Four day Food Record	4DFR
Gram	g
Healthy Eating Index	HEI
Healthy Eating Index for Canadian	HEI-C
Healthy Eating Index-2005	HEI-2005
High Fat, Sugar, and Salt foods and snacks	HFSS
Intra-class Correlation Coefficient	ICC
Kilo calories	Kcal
Kolmogorov-Smirnov	K-S
Mediterranean Diet Quality Index for children and adolescents	KIDMED
Mediterranean Diet Score	MDS
Mediterranean Lifestyle Index	MEDLIFE

Microgram	μ g
Milligram	mg
Monounsaturated Fatty Acids	MUFA
New Zealand	NZ
Number	n
Nutrient Reference Values	NRVs
Nutrient-Rich Food index	NRF-index
P-value	*P*
Polyunsaturated Fatty Acids	PUFA
Preschoolers Diet–Lifestyle Index	PDL-Index
Recommended Dietary Intakes	RDI
Revised Children's Diet Quality Index	RC-DQI
Saturated Fatty Acids	SFAs
Serving per day	Serve/d
Shapiro-Wilk	S-W
Standard Deviation	SD
Statistical Package for the Social Science	SPSS
Television	TV
Trans Fatty Acids	TFAs
Update the Healthy Eating Index-C 2009	HEIC-2009
Upper Level of Intake	UL
US Department of Agriculture	USDA
Youth Healthy Eating Index	YHEI